bart
impact
program

# ANALYSIS OF PRE-BART URBAN RESIDENTIAL ENVIRONMENT SURVEY




working paper

The BART Impact Program is a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART).

The program is being conducted by the Metropolitan Transportation Commission, a nine-county regional agency established by state law in 1970.

The program is financed by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally-funded portion of the program is vested in the U.S. Department of Transportation.

The BART Impact Program covers the entire range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors will be measured and analyzed. The benefits of BART, and their distribution, will be weighed against the negative impacts and costs of the system in an objective evaluation of the contribution that the rapid transit investment makes toward meeting the needs and objectives of this metropolitan area and all of its people.

DOCUMENT NO. WP 24-4-76

DOT-OS-30176

BART IMPACT PROGRAM

# ANALYSIS OF PRE-BART URBAN RESIDENTIAL ENVIRONMENT SURVEY

MARCH 1976

WORKING PAPER

DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VIRGINIA 22151

PREPARED FOR
U. S. DEPARTMENT OF TRANSPORTATION

AND
U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

## NOTICE



PREPARED BY
**DE LEUW, CATHER & COMPANY**

SUBCONTRACTOR TO
**GRUEN ASSOCIATES, INC.**

UNDER CONTRACT WITH THE
**METROPOLITAN TRANSPORTATION COMMISSION**

FOR THE
**U. S. DEPARTMENT OF TRANSPORTATION**

AND THE
**U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT**

UNDER
**CONTRACT DOT-OS-30176**
**TASK ORDER 4**

MARCH 1976

| BIBLIOGRAPHIC DATA SHEET | 1. Report No. WP 24-4-76 | 2. | 3. Recipient's Accession No. |
|---|---|---|---|

**4. Title and Subtitle**
ANALYSIS OF PRE-BART
URBAN RESIDENTIAL ENVIRONMENT SURVEY

**5. Report Date**
March 1976

**6.**

**7. Author(s)**
DE LEUW, CATHER & COMPANY

**8. Performing Organization Rept. No.**

**9. Performing Organization Name and Address**
METROPOLITAN TRANSPORTATION COMMISSION
Hotel Claremont
Berkeley, California 94705

**10. Project/Task/Work Unit No.**
Task Order 4

**11. Contract/Grant No.**
DOT-OS-30176

**12. Sponsoring Organization Name and Address**
U.S DEPARTMENT OF TRANSPORTATION
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Washington, D.C.

**13. Type of Report & Period Covered**
Working Paper

**14.**

**15. Supplementary Notes**
De Leuw, Cather is associated with Gruen Associates, Inc. as prime contractor.

**16. Abstracts**

This report presents an analysis of a 1972 home interview survey of 2,541 persons living near BART, after most of the system's construction but before its operation. Most of the survey dealt with anticipated rather than actual impacts, although perceived impacts of the system's construction were included. The analysis emphasized tests of the significance of relationships between perceived (or anticipated) BART environmental impacts and hypothesized determinants of those perceptions including specific characteristics of BART, its physical setting, and the respondents themselves. Results of the analysis included the finding that most residents had very favorable attitudes and expectations regarding BART's effects on them. Variations in these responses tended to be related mainly to the respondent's distance from BART and his or her plans to make use of the system.

**17. Key Words and Document Analysis. 17a. Descriptors**

Bay Area Rapid Transit System (BART)
BART Impact Program
Environmental Impacts, Rapid Transit
Construction Impacts, Rapid Transit
Attitude Surveys, Rapid Transit

**17b. Identifiers/Open-Ended Terms**

**17c. COSATI Field Group**

| 18. Availability Statement | 19. Security Class (This Report) | 21. No. of Pages |
|---|---|---|
| Document is available to the public through the National Technical Information Service, Springfield, Virginia 22151 | UNCLASSIFIED | 50 |
| | 20. Security Class (This Page) UNCLASSIFIED | 22. Price |

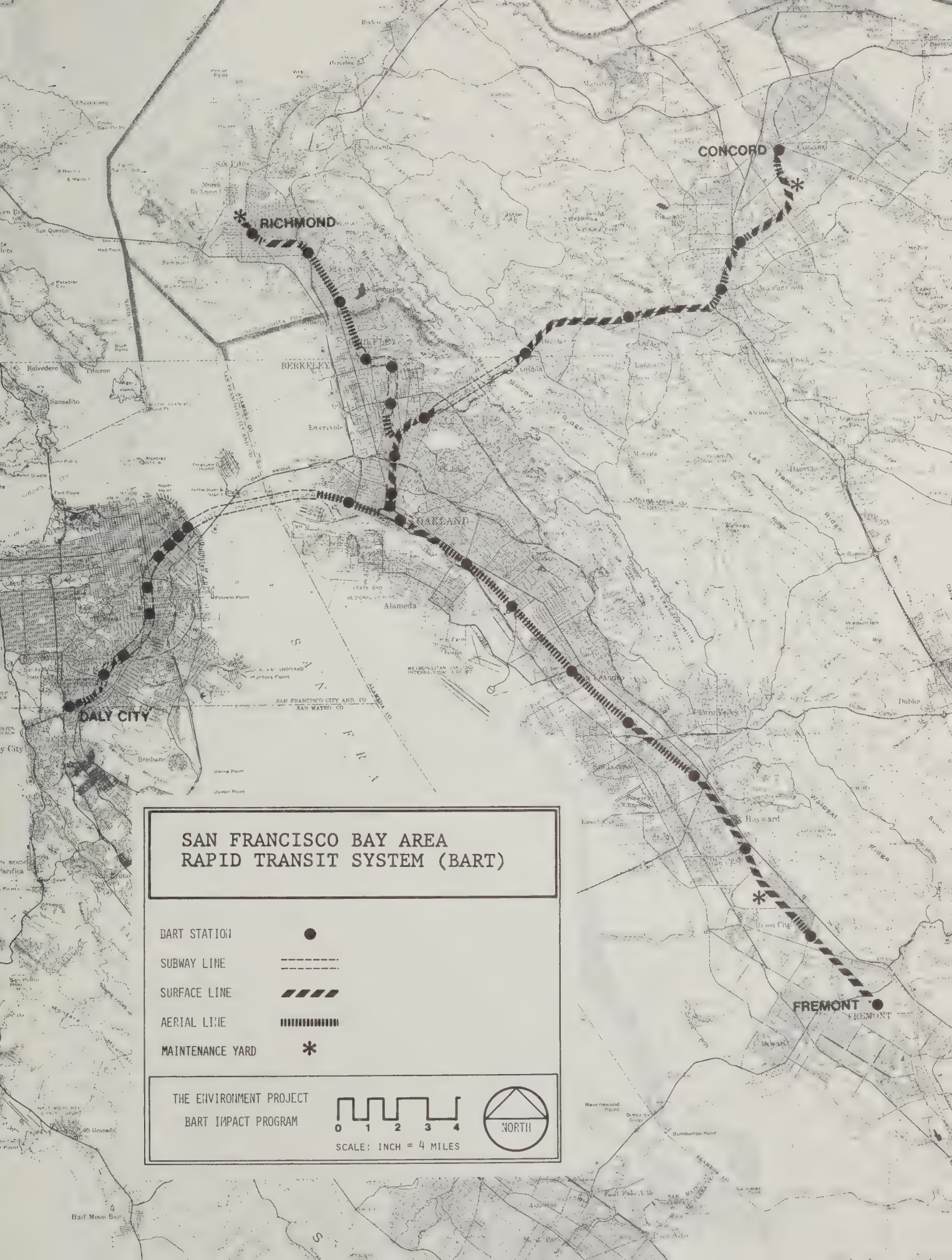
# PREFACE

The BART Impact Program (BIP) is a comprehensive, policy-oriented study and evaluation of the impacts of the new San Francisco Bay Area Rapid Transit System (BART). The system's alignment and configuration are shown on the page following this preface. The BART Impact Program covers the entire range of potential rapid transit impacts, with major projects covering impacts on traffic flow, travel behavior, land use and urban development, economics and finance, social institutions and lifestyles, public policy and the environment. The incidence of these impacts on population groups, local areas, and economic sectors is being measured and analyzed. The benefits of BART, and their distribution, are being weighed against the negative impacts and costs of the system in an objective evaluation of the contribution that the rapid transit investment makes toward meeting the needs and objectives of the Bay Area and all of its people.

The Environment Project focuses on the effects of BART's physical presence on its surroundings. Environment is defined broadly to include five components: acoustic, atmospheric, natural, social and visual. Within each of these components the Environment Project will address two related phenomena:

- Direct and indirect physical effects upon the environment brought about by the BART system
- Social and psychological consequences of these physical changes to the environment

This report -- Analysis of Pre-BART Urban Residential Environment Survey -- documents a statistical analysis of results of a large home interview survey, conducted in 1972 after most of the BART system was built but not yet in operation. Respondents were residents of the area near BART, throughout its 71-mile length. The intent of this analysis was to search this "pre-BART" data set for information useful in the Environment Project's study of "post-BART" environmental impacts as perceived by persons living in the areas exposed to them. This report covers study methodology as well as findings, and is a background document for the project's Phase II "post-BART" interview survey and its analysis.


CONCORD
RICHMOND
BERKELEY
OAKLAND
Alameda
DALY CITY
FREMONT
SAN FRANCISCO BAY AREA
RAPID TRANSIT SYSTEM (BART)
BART STATION
SUBWAY LINE
SURFACE LINE
AERIAL LINE
MAINTENANCE YARD
THE ENVIRONMENT PROJECT
BART IMPACT PROGRAM
0 1 2 3 4
SCALE: INCH = 4 MILES
NORTH

# CONTENTS

# SUMMARY

## BACKGROUND AND OBJECTIVES

This analysis is built upon portions of the Urban Residential Environment Survey (URES) data base developed as an early part of the BART Impact Program.* This series of surveys and related data collections took place primarily in June and July, 1972, after most of BART's construction but prior to its operation. These data included two interview surveys of perceived residential environmental quality, both with the same content but different sample designs. One was a 2541-respondent survey randomly drawn from the households within one mile of the entire BART system, and the other was a 616-person survey with about 20 responses taken in each of 30 small "special sites" primarily within 1/8-mile of BART.

The analysis reported here was part of the Environment Project's Phase I work, and was completed in March of 1975. Its purpose was to search the URES survey data for findings relevant to the Environment Project. Four objectives were defined for this purpose:

- To present results of the response to the survey's questions concerning generalized response to BART, as an indicator of the general extent and distribution of positive and negative feelings prior to BART's operation;
- To analyze the anticipated impacts of BART in operation, with respect to a set of potential determinants of the reported responses;
- To analyze perceived effects of BART's physical facilities with respect to a small set of potential determinants of the reported responses; and
- To analyze perceived construction impacts with respect to the respondent's exposure to BART construction.

Principal findings which follow are summarized under these four general objectives.

---

*Frances Carp et al, Residential Quality Prior to the Opening of BART, Part II, Volume I of BART Impact Studies Final Report Series (BART-II) (Berkeley: Institute of Urban and Regional Development, University of California, 1973).

## GENERAL INDICATORS OF IMPACT

### General Feelings Toward BART

- Over half of the systemwide survey respondents were glad about BART's presence near their homes, and most of the rest were indifferent. Fewer than ten percent said that BART was a bad idea or that they were opposed to its presence.

- Those expecting to use BART were typically far more positive toward its presence (5 percent against BART) than were those who did not expect that they or their families would travel on the system (25 percent against). This was the strongest and most consistent correlate of pro-BART attitudes identified in the study.

- The proportion of respondents unhappy with BART's nearness was very low within all subgroups of the sample classified by nearest BART configuration (subway, aerial, grade) and distance to line or station (1/4-mile increments). However, more of the respondents (12 percent) in areas within 1/4-mile of BART's above-ground lines and stations tended to be unhappy about BART's nearness than did persons living farther from BART or near its subway portions.

- Indifference to BART's effect on the respondent's area "as a place to live" tended to rise slightly with increasing distance from BART lines and stations, with both positive and negative attitudes diminishing somewhat in compensation. This suggests that persons living nearer BART were likely to be more often aware both of its potential benefits and disadvantages.

### Moving Behavior

- There was no indication that a significant degree of moving had occurred either to get closer to BART or farther from it. Although over a third of the respondents reported knowing people who had moved into or out of the area recently, virtually none of these moves were reported as being related to BART.

### Actions For or Against BART in the Area

- Fewer than ten percent of the systemwide sample respondents had done anything either for or against BART, including talking to neighbors or voting for any public office candidates because of sympathy with their views on BART. However, from 40 to 75 percent of the respondents in seven of the special sites (within 1/8-mile of BART),

primarily at stations with parking lots, had taken at least one action against BART. Counter to the systemwide sample results, in which most of the few actions taken were pro-BART, actions in the special sites (within 1/8-mile of BART) were much more frequent and usually against BART.

## ANTICIPATIONS OF IMPACTS OF BART IN OPERATION

### General Relationships

- For most types of impact, there was a marked decrease in the frequency of anticipations at about 1/4-mile from BART. Beyond that point the level of concern over many impacts became insignificant. This suggests that the post-BART interview surveys may not need to be extended as far as a mile from BART. An area within 1/4- to 1/2-mile may be adequate, provided that the Environment Project's physical impact assessment studies do not conclude that the actual distribution of physical effects is broader.

- Expected use of BART was the most consistent and powerful predictor of many anticipated impacts. Persons expecting to use BART tended to be much more optimistic than others concerning its potential impacts in their areas. This indicates that future surveys should include questions on actual BART use as a likely determinant of attitude toward its other (environmental) effects.

- A variety of other hypothesized predictors of anticipated impacts were tested, including both personal attributes and environmental characteristics. Aside from expected use of BART, none of the hypothesized predictors accounted for as much as ten percent of the variation in any of the measures of response to anticipated impacts. Most which were significant accounted for only one to three percent of the response variation.

- In addition to the low predictive power of most hypothesized determinants, for most response measures few determinants were found to be significantly related. This indicates that the phenomena under study are more complex than can be described by the limited set of predictors used.

### Specific Relationships

- Many of the survey's indicators of anticipated impact grouped naturally through factor analysis into an urban development or land use impact index. Respondents ex-

pecting more development nearby due to BART tended to be younger, more likely to be renters, and to live closer to a BART station than others.

- A second factor indicated the expectation that BART would improve the area's general level of physical amenities (quiet, appearance, enjoyment of outdoors, etc.). Respondents inclining toward this view tended to be older and planned to use BART more than others.

- Anticipations of such impacts as more traffic, dust and dirt, "undesirable people moving in," litter, and the like formed a "neighborhood deterioration" factor. Near BART stations those inclined more toward such beliefs tended to be younger, did not expect to use BART, and lived closer to railroads than did others in the same general proximity to stations. Among residents near aerial stations specifically, this relative pessimism was found most often among poorer, less educated persons who felt less able to effect changes in their community. They also tended to be renters, and to live in more crowded dwellings nearer freeways, railroads, and the BART station itself.

- The set of predictors used provided no clearly meaningful correlates of the belief that BART would cause a reduction in freeway traffic and automobile-caused air pollution.

- Concern over BART's potential noise impacts (due to people and traffic) near aerial stations was highest among those living in relatively crowded dwellings closer to a railroad and to the BART station itself. These respondents also tended to feel generally less able to change conditions in their communities, suggesting that concern over this noise impact tended to be greatest among those most exposed to the impact (by proximity) and who felt least able to influence it.

- It was found that the only clear and consistent correlate of concern over BART train noise and vibration (among those within 1/4-mile of an aerial line and hence generally most exposed) was distance to the tracks.

PHYSICAL-FACILITY IMPACT INDICATIONS

- Relative to BART's visual role in the urban landscape, the data indicated that about 15 percent of the respondents within one mile of BART could see some part of the BART system from their homes.

- The extent of BART's role as a barrier, as defined by "cutting the respondent off from part of his old neighborhood," was reported as two to three times as great within 1/4-mile of the system's at-grade lines (11 percent of respondents) and above-ground stations (17 percent) as elsewhere.

- The four special sites which had the highest incidence of reported barrier effects were station sites rather than at-grade line sites with fences or embankments. This suggests that this item was interpreted to refer to the loss of part of a neighborhood through its demolition for a parking lot as well as interposition of a physical barrier to access.

CONSTRUCTION IMPACTS

- Most kinds of construction impact were reported as unpleasant by ten percent or fewer of the systemwide sample members. These proportions were consistently greater among respondents in subway areas and less severe in aerial configuration areas. At-grade (embanked) area responses tended to fluctuate between these two extremes for different kinds of impact. Exceptions found were in residential demolition and moving, which were reported mainly in above-ground station areas (where land takings for parking lots were extensive).

- Virtually all construction impacts tended to be reported less frequently among respondents living farther from BART. The only exceptions were travel-related impacts, which in most areas displayed no consistent relationship with distance. This suggests that BART construction may have been viewed as a substantial barrier to many local and regional auto trips originating throughout the BART corridor and perhaps beyond it, rather than affecting only those living very near the system.

- Despite the systemwide sample's more frequent reports of adverse construction impact in subway areas, in special sites sample such impacts were most frequently mentioned at several of the station sites. Most of these sites were above ground, and all but one had parking lots. This suggests that these very specific small areas (land-extensive stations) were points of especially heavy perceived construction impact.

## APPROACH

### THE DATA BASE

The Urban Residential Environment Study (URES), a part of the University of California "BART-II" portion of the BART Impact Program, was intended to provide a basis for assessing the effect of the establishment of the BART system on environmental quality. It was built around a systemwide home interview survey of 2,541 persons living within one mile of the BART tracks. A second part of the pre-BART strategy involved collection of similar data from 616 residents in some 30 "special sites," including 28* abutting BART and two distant control sites. In both surveys census block data and geographic descriptors of the residential site were also compiled. Field work took place in June and July of 1972, shortly before opening of the Fremont line (September 11), BART's first operational portion. More detailed description of these data sets and relevant publications is available in the BART Impact Program Data Summary.**

### PURPOSES AND OBJECTIVES OF ANALYSES

These "pre-BART" data are potentially useful for the Environment Project (ENV) in several ways. First, although assessment of the impacts of BART's construction is not a major element of the ENV research, these data do provide substantial information on residents' views of the nature and extent of such effects. Second, the data include some limited reportage of residents' pre-operations responses to BART as a physical entity. This has to do primarily with its visibility and its effects as a physical barrier to neighborhood circulation.

Finally, there is fairly extensive coverage of respondents' anticipations of impact once BART is in full operation. This is useful in at least two ways. First, it provides an indicator of prior concerns and beliefs, for later comparison with actually measured impacts and associated responses of those affected. This may be informative to residents of other cities facing proposed rapid transit development in

---

*Three sites were later dropped by the pre-BART researchers for economy; data are incomplete on these but usable for some purposes.

**Susan Bachman, BART Impact Program Data Summary, BART Impact Program, Document No. WP 8-1-75 (Berkeley: Metropolitan Transportation Commission, 1974).

their neighborhoods. It also may yield early clues to the differences in "post-BART" (yet to be collected) responses by persons with different characteristics and under various impact conditions. This possibility, although tenuous, may aid in the design of the "post-BART" interview surveys, both in the selection of specific study sites and sampling procedures and also in the choice of the most important items for the survey instrument.

Accordingly, four objectives were identified for this analysis:

1. To present results of the response to the survey's questions concerning generalized response to BART, analyzed by the respondent's location relative to BART, as an introductory indicator of the general extent and distribution of positive and negative feelings;

2. To analyze perceived construction impacts with respect to the respondents' estimated exposure;

3. To analyze perceived barrier effects of BART with respect to a set of potential determinants of the reported responses; and

4. To analyze the anticipated impacts of BART in operation with respect to a set of potential determinants of the reported responses.

## STRATEGY AND METHODS

In principle, the approach taken here is a progression from a general level to a more specific focus on the nature and location of various responses. Of primary interest is whether the individual's location, in terms of distance from BART lines or stations, and the nearby configurations of BART (basically subway or above-ground) are meaningfully related to the extent of one's concerns regarding impact. Beyond these basic and general hypothesized "determinants" of impact, selected physical features of the environment which might alter the nature of BART's environmental impact are also of interest. These might include, for example, the level of background noise, or the distance to major noise-producing facilities such as nearby freeways. Finally, we are also concerned with the social situation (characteristics of the surrounding population) and personal characteristics (e.g., age, income, particular sensitivities) of individuals which might further influence their response to a particular kind of actual environmental impact.

For these concerns, and given the nature and limitations of the data as already described, cross tabulations (contingency tables) were selected as an appropriate basic analytical device. The intent, in all the objectives of this analysis, was to find whether and for which kinds of impact issues each of the possible determinants appeared to assist in understanding the response. Accordingly, each response item was cross tabulated against each of the predictors, BART configuration and distance from BART. This was done first without controls and then with one of the predictors held constant (i.e., two-way and then three-way tabulations). Separate analyses were conducted for distance to BART stations and lines. In addition to successive refinement of focus, this use of controls allowed inspection for simple interaction effects between the two predictor variables. Where appropriate the chi-square was used to verify significance.

Because of the large number of variables involved, this procedure generated large numbers of tables. To reduce the response data to manageable proportions, a factor analysis* of the anticipated impacts question pool (30 items) was employed. This identified six factors, four of which were relevant to ENV concerns in addition to being satisfactorily strong and logically consistent. These four factors plus several of the original data items were used as dependent variables in the final analyses of anticipated impacts.

In these analyses of anticipated impacts, further potential determinants of impact and response were identified at this stage. This was done first through selection of candidate variables using subjective judgment and results of prior studies, including earlier analyses of these data by others.** Purely exploratory analyses, using many independent variables without an a priori rationale, were not done.

These candidate "predictors" were then tested for the significance of simple correlation with the appropriate response variables. Where approximately interval scales could not be assumed, cross tabulations and chi-square tests were employed. Predictors which passed this standard screening were then used in cross tabulations with further controls. In general, these were done using subsets of the respondent pool based on distance from BART and its various configurations.

---

*See Appendix for table of factor loadings.

**See for example Carp, Residential Quality Prior to the Opening of BART.

As a final step in the investigation of anticipations of impact, the analysis of variance was used both as a check on the earlier use of contingency table methods of significance testing and also to provide estimates of the proportion of response variance accounted for by some of the more important predictors identified.

## LIMITATIONS ON ANALYSIS

Several limitations on this analysis should be understood clearly by the reader. These are imposed primarily by the data itself, but also by the circumstances of this analysis. Some of the most important are as follows:

1. Content of the data set: Some concerns of the Environment Project or of interest to others are covered either incompletely or not at all in the data and therefore cannot be addressed in detail. This is especially evident in the case of specific possible impacts such as illumination, shadow, appearance, security and safety.

2. Sampling designs: Generalizability of findings is limited somewhat by the systemwide sample's use of a cluster design. More serious, however, is the non-random (quota) selection of respondents for the "special sites" interviews. (These special site samples were not originally intended to be used in statistical inference.)*

3. Sample coverage: Although the overall sample size is quite large (n=2541) for the systemwide sample, the diversity of impact conditions and determinants results in typically small numbers of respondents in similar circumstances. This is even more the case in the special sites: each site sample includes only about 20 respondents.

4. Ambiguity of survey questions: As in most surveys, some items were worded in such a way that more than one interpretation of their meaning was possible. For example, the item "Does BART in any way cut you off from what used to be part of your neighborhood?" was apparently interpreted by some to include not only the system's barrier effects but also the homes removed by BART's land needs for parking lots.

5. Response formats and coding: The requirements of some kinds of statistical analysis are not met by some of the data. For example, many of the responses are coded into

---

*Donald Appleyard et al, Rationale and Procedures for Collection of Behavioral and Environmental Data, Part II, Volume VI, BART Impact Studies Final Report Series (1973).

discrete, unequal-interval categories or other simplified formats which limit the use of powerful correlation-based techniques.

6. Skewed response distributions: It is a general finding of the survey that relatively few respondents indicated concern over BART's impacts. As a result the analysis must often focus on small subsets of respondents. This also violates the requirements of some analytical techniques which depend upon balanced distributions.

In addition to these limitations of the data, the Environment Project's schedule, specific requirements, and resource limitations acted as further constraints. The pre-BART data set is a large and diverse one, by no means wholly or solely relevant to the Environment Project's concerns. A "full analysis" of its content is neither appropriate nor possible within the resources of the present study. This study, therefore, includes only those items most relevant to the Environment Project.

## DISTRIBUTION OF SYSTEMWIDE SURVEY RESPONDENTS BY DISTANCE TO BART AND NEAREST BART CONFIGURATION

As a means of familiarization with the pre-BART systemwide sample, and particularly as a check for any peculiarities in the geographic distribution of the respondents, descriptive cross tabulations of the number of respondents by BART configuration and distance were run. Since the sample had been drawn at a rate intended as proportional to census tract population, this also provided a general indication of the actual population distribution with respect to BART. These tabulations are presented with respect to BART tracks and BART stations in Tables 1.1 and 1.2. Principal findings drawn from this introductory exercise are as follows:

- About 30 percent of the respondents live within 1/4-mile of the BART line, varying somewhat with configuration. However, within this 1/4-mile further cross tabulations showed that only one-third as many respondents lived within 1/8-mile of the tracks than in the same size area between 1/8- and 1/4-mile away. This was true for all configurations, and reflects the use of much of the land abutting the BART line for commercial, industrial and other transportation purposes.

- Nearly 45 percent of the survey respondents live adjacent to a subway BART line rather than an above-ground section, although less than a third of the line is in subway. Re-

TABLE 1.1
DISTRIBUTION OF SYSTEMWIDE SURVEY RESPONDENTS BY DISTANCE TO BART TRACKS AND NEAREST BART LINE CONFIGURATION

| | | Nearest BART Configuration | | | | | |
|---|---|---|---|---|---|---|---|
| | | Subway | Grade | Aerial | Total | %* | |
| Distance to BART Line | 0 < 1/4 mile | 364 | 179 | 210 | 753 | (30.9) | 96% of Total |
| | 1/4 < 1/2 mile | 276 | 178 | 231 | 685 | (28.2) | |
| | 1/2 < 3/4 mile | 312 | 198 | 136 | 646 | (26.6) | |
| | 3/4 < 1 mile | 168 | 87 | 94 | 349 | (14.3) | |
| | > 1 mile | 15 | 63 | 30 | 108 | - | |
| | Total | 1,135 | 705 | 701 | 2,541 | | |
| | Percent | (44.7) | (27.7) | (27.6) | (100.0) | | |

*Of those within 1 mile only. (The remainder were apparently drawn in error, since they lived outside the intended study area).

TABLE 1.2
DISTRIBUTION OF SYSTEMWIDE SURVEY RESPONDENTS BY DISTANCE TO BART STATION AND NEAREST BART STATION CONFIGURATION

| | | Nearest BART Configuration | | | | |
|---|---|---|---|---|---|---|
| | | Subway | Surface | Total | %* | |
| Distance to Nearest BART Station | 0 < 1/4 mile | 178 | 159 | 337 | (16.0) | 83% of Total |
| | 1/4 < 1/2 mile | 362 | 223 | 585 | (27.8) | |
| | 1/2 < 3/4 mile | 355 | 257 | 612 | (29.1) | |
| | 3/4 < 1 mile | 311 | 261 | 572 | (27.2) | |
| | > 1 mile | 93 | 342 | 435 | - | |
| | Total | 1,299 | 1,242 | 2,541 | | |
| | Percent | (51.1) | (48.9) | (100.0) | | |

*Of those within 1 mile only.

spondents near above-ground sections of BART are evenly divided between grade (including earth embankments, generally low) and aerial configurations.

- Only 17 percent of the respondents live more than a mile from a BART station (even though many of the stations are spaced as much as three miles apart). Approximately half of these live near a subway station.

- About 13 percent of the respondents live within 1/4-mile of a BART station. This is true both for subway and above-ground stations. Another 23 percent live in the concentric ring from 1/4- to 1/2-mile from a station.

The initial plan for this analysis envisioned division of the entire sample into a single set of categories based on proximity to BART. Separate categories were to be provided for respondents near a BART station and for those not near a station but near a BART line. The intent here was to reduce the number of analyses to be communicated as an aid in the reader's assimilation of the results. However, the initial tabulations just described showed that nearly all the respondents (83 percent) lived within a mile of a BART station. It was, therefore, not possible to isolate respondents in sufficient number who were subject to line impacts more than station impacts, and yet use a large enough distance (one mile) to allow tests of its importance. Accordingly, this approach was abandoned. In most of the analyses of the succeeding chapters all responses are analyzed both with respect to the BART line and its stations, in separate tabulations.

# GENERAL INDICATORS OF IMPACT

## GENERAL FEELINGS TOWARD BART

This section includes consideration of the survey's questions which dealt with indicators of the respondents' general feelings toward BART. These items, along with their overall response distributions, are shown in Table 2.1. In addition, this table shows overall responses to a combination of two questions concerning expected use of BART. As asked, these dealt separately with whether the respondent expected that (1) he or she, or (2) his/her family would use BART. A further set of indicators of BART's overall effect, moving behavior attributable to BART, is discussed in a later section of the chapter.

### General Results

In general, only small fractions of the responses to the three general indicators of Table 2.1 were negative. Over 85 percent of the respondents thought that BART was a "good idea" (Q 40a), while only nine percent thought it was at least somewhat of a bad idea. Only five percent said they were sorry to have BART running near their homes (Q 43), and only ten percent thought that BART would make their area less desirable as a place to live (Q 49).

### Was BART a Good Idea (Q 40a)

#### Effect of Expected Use of BART

A first step in analysis of this item was to investigate the effect of expected use of BART on general feelings toward the system (Q 40a), since this was the most general question. Here the general hypothesis was that those who expect to use BART are more likely to be positive about its overall value. This relationship was found to be highly significant ($p<.01$). In general, about 25 percent of the respondents not expecting to use the system felt that BART was a bad idea, in contrast to less than five percent of those expecting to use it.

#### Effect of Distance (with Expected Use)

When controlled for distance (both from BART lines and stations), this relationship of expected use to attitude toward BART held up for each 1/4-mile increment, although distance itself did not appear to have a meaningful effect on the responses. That is (as a partial interpretation), of the respondents not expecting to use BART, those living farther from it seemed

TABLE 2.1
UNCONTROLLED RESPONSES ON GENERAL FEELINGS

40a. "All things considered, which...(of these statements)...best describes how you feel about the whole idea of having the BART system?"

| | | n | % |
|---|---|---|---|
| 1. | Extremely good idea | 758 | (30) |
| 2. | Very good idea | 848 | (34) |
| 3. | Somewhat of a good idea | 519 | (21) |
| 4. | Neither good nor bad | 151 | ( 6) |
| 5. | Somewhat of a bad idea | 103 | ( 4) |
| 6. | Very bad idea | 50 | ( 2) |
| 7. | Extremely bad idea | 64 | ( 3) |
| 8. | No opinion | 48 | n/a |
| | | 2,541 | (100) |

43. "How do you feel about BART running near your home... are you (list)?"

| | | n | % |
|---|---|---|---|
| 1. | Very glad | 656 | (26) |
| 2. | Rather glad | 652 | (26) |
| 3. | Don't care | 1,091 | (43) |
| 4. | Somewhat sorry | 80 | ( 3) |
| 5. | Very sorry | 62 | ( 2) |
| | | 2,541 | (100) |

49. "In general, what effect do you think BART will have on this area as a place to live?"

| | | n | % |
|---|---|---|---|
| 1. | Very much improve this area as a place to live | 241 | (10) |
| 2. | Somewhat improve this area as a place to live | 814 | (32) |
| 3. | Have no effect on this area as a place to live | 1,236 | (48) |
| 4. | Make this area somewhat less desirable as a place to live | 200 | ( 8) |
| 5. | Make this area very much less desirable as a place to live | 50 | ( 2) |
| 6. | Can't say | - | - |
| | | 2,541 | (100) |

52a/52b. "Are you, yourself...(or) other people in your household...planning to use BART when it is operating?"

| | | n | % |
|---|---|---|---|
| 1. | Will probably not use BART | 558 | (22) |
| 2. | Will use BART once in a while | 1,298 | (51) |
| 3. | Will use BART frequently | 506 | (20) |
| 4. | Can't say yet | 179 | ( 7) |
| | | 2,541 | (100) |

about as likely to be generally negative about it as those living nearest to it. This does not support the general hypothesis that persons living close to BART (and therefore presumably most subject to its environmental impacts) would be most likely to exhibit a negative attitude toward the system. Thus, tentatively, it appears that concern over environmental impact because of residence very near the BART lines and stations was not a dominant factor, even in the attitudes of those not expecting to use the system.

This lack of effect of distance on response was verified in a tabulation of the proportion of negative attitudes ("somewhat, very, extremely bad idea") toward BART by distance from the tracks and controlled for expected use. Although standard tests of significance are not usable here, Table 2.2 indicates that there was no meaningful relationship of response to distance within any expected user group. Findings were similar when tabulated by distance to the nearest station.

TABLE 2.2
PERCENTAGE OF RESPONDENTS JUDGING BART AS A "BAD IDEA" (Q 40a) WITHIN EACH DISTANCE/EXPECTED BART USE CATEGORY*

| Distance from BART Line | Expected Use of BART: Use Often | Use Some | Not Use | Don't Know | Total |
|---|---|---|---|---|---|
| 0 > 1/4 mi. | 2.6% | 6.1% | 26.4% | 8.9% | 9.2% |
| 1/4 > 1/2 mi. | 1.4 | 5.4 | 29.4 | 8.5 | 9.1 |
| 1/2 > 3/4 mi. | 1.6 | 3.7 | 23.5 | 1.7 | 7.3 |
| 3/4 > 1 mile | 2.7 | 4.5 | 25.7 | 10.5 | 9.2 |
| Total | 2.1% | 5.0% | 26.2% | 6.5% | 8.6% |

*Example of how to read table: Of those living between 1/2- and 3/4-mile from BART, and who expect to make some use of BART, 3.7 percent said they thought BART was a "bad idea."

Reasons Given for Response to Q 40a

In the interview, respondents were asked for reasons for their general attitude toward BART. The responses were classified into 34 categories, of which nine were related to environmental impact concerns. Overall, of the 34 reasons, reductions in traffic and air pollution were the only environment-related ones prominently mentioned. Table 2.3 indicates the proportion of respondents who gave each of the environment-related reasons for their general attitudes. Results are presented for respondents living within 1/4-mile of the tracks, by line con-

figuration. Response distributions for nearest station configuration were similar, and distance from BART did not appear to be meaningfully related for any item.

TABLE 2.3
PERCENTAGES OF RESPONDENTS CITING ENVIRONMENT-RELATED REASONS FOR THEIR GENERAL ATTITUDES TOWARD BART, BY NEAREST BART LINE CONFIGURATION AND WITHIN 1/4-MILE OF NEAREST BART LINE

| | BART Configuration | | | |
|---|---|---|---|---|
| | Subway (n=364) | Grade (n=179) | Aerial (n=210) | Total (n=753) |
| Positive Expectations: | | | | |
| 516. Reduce number of cars | 13% | 10% | 14% | 12% |
| 517. Reduce traffic | 20 | 18 | 16 | 18 |
| 528. Less pollution | 23 | 37 | 23 | 27 |
| 529. Less noise | 0 | 1 | 2 | 1 |
| 531. Fewer accidents | 2% | 7% | 5% | 4 |
| Negative Expectations: | | | | |
| 536. Won't help traffic | 1% | 2% | 2% | 1 |
| 538. Not enough parking | 1 | 1 | 0 | 1 |
| 540. Destroyed neighborhood | 1 | 1 | 0 | 1 |
| 542. Earthquake fears | 2% | 0% | 0% | 1% |

## Feelings About BART Near Home (Q 43)

### Effect of Distance and Configuration

Inspection of cross tabulations with distance and configuration used alternately as independent variables and controls indicated considerable interaction between these two determinants The overall effect of differences in configuration was found to be statistically significant at the .05 level or better, both with respect to lines and stations; however, when controls for distance were added it was found that significance of line or station configuration disappeared beyond about 1/2 mile from BART. Similarly, with controls for line or station configuration, a somewhat higher incidence of negative response ("sorry that BART is near home") was found among respondents within about 1/4- or 1/2-mile of BART's above-ground configurations. The incidence of negative response among those living near subway rather than above-ground configurations did not vary appreciably or consistently with distance from BART.

It should be noted in addition to these relationships that the incidence of expressed regret at BART's being near the home was extremely low in all distance/configuration categories. Proportions of negative responses ranged from a low of 2.5 percent (subway line, intermediate distance) to a high of 12.2 percent (at-grade line, 0 to 1/4-mile). This contrasts with indifference ranging from 34 percent to over 50 percent, and respondents glad to have BART near of from 42 percent (aerial line, 0 - 1/4-mile) to over 60 percent (subway lines and stations, 0 - 1/4-mile).

These results suggest a generally high acceptance of BART, with slightly lower acceptance among residents of areas closest (0 - 1/4-mile) to the system's above-ground lines and stations.

Effects of Expected Use of BART

The analysis of response to Q 43 was extended to consider the effect of the respondent's expectation of BART use by himself/herself or others in the household, controlled for distance to BART. As in the earlier analysis of Q 40a, the effect of this variable proved to be highly significant ($p<.01$). Well over 70 percent of the respondents at most distances from BART lines or stations who expected to make frequent use of the system were glad to have it nearby, in contrast to only 12 - 25 percent of those not planning to travel by BART. Small sample sizes precluded significance tests on the direct effect of distance with expected use of BART as a control.

These results indicate that expected BART use may be an extremely powerful predictor of attitudes toward BART. This may prove to hold true for prediction of attitudes concerning specific impacts as well.

Expected Effect of BART "On This Area as a Place to Live" (Q 49)

Interpretation of this item is somewhat clouded by the ambiguity of the term "this area." It is not clear whether respondents took this to mean the neighborhood or a larger area such as a town. Nonetheless, the item provides a third indication of general attitude and does focus on the "quality of life," a concept of interest in the Environment Project.

Effects of Distance and Configuration

Cross tabulations of response to this item by distance to BART tracks and nearest station both yielded statistically significant chi-squares (0.5 level or better). However, inspection of the relationship shows that it is somewhat more complex

than expected. The hypothesis originally underlying the test was that persons nearer BART would be less positive in their evaluation of its effect "on the area as a place to live." However, the tabulations show that both positive and negative responses actually decreased as distance from BART increased. What increased, counter to the hypothesis, was indifference.

The uncontrolled relationship of nearest-station configuration (as in prior analyses, subway versus above-ground) to response did not yield a significant chi-square. With the addition of controls for distance, the use of BART configuration as a predictor of response continued to be unsupported. The only exception was at the last increment of distances (3/4- to one mile), where in areas with subway stations both positive and negative sentiments were significantly lower than in above-ground areas, with correspondingly increased indifference. This did not seem to be of major substantive importance.

By contrast, BART channel configuration proved to be marginally significant ($p \simeq .05$) without distance controlled. Here again however, contrary to expectations the same pattern was displayed: the variate actually operating appeared to be indifference versus intensity of opinion (both positive and negative), rather than positive versus negative. With the application of a control for distance, some interaction effects were suggested. However, statistical significance of the configuration/response relationship was not sustained, except at the 3/4-mile to one mile interval as in the station configuration effects analysis. Therefore, this analysis was not extended, except for a final non-statistical comparison of the proportion of negative responses (anticipation of a bad effect of BART on the area) controlled simultaneously for distance and configuration. This was done both with respect to the BART line configuration and nearest station type. Proportions ranged from a low of three percent to a high of 18 percent (within 1/4-mile of an above-ground station). However, no clear relationship was found.

These findings do not support the earlier hypotheses that persons nearer BART, or in areas with above-ground or subway configuration, will be less positive about its effects on the quality of life. They do, however, seem to indicate that indifference tends to rise with increasing distance from BART lines and stations. This in turn suggests that those living nearer BART are likely to be more aware of both its potential benefits and threats.

TABLE 2.4
RESPONSES TO MOVING - BEHAVIOR ITEMS

50a. "Do you know anyone who has moved here...within the last two or three years?"

| | n | % |
|---|---|---|
| 1. No | 1,500 | ( 59) |
| 2. Yes, and think BART was involved | 87 | ( 3) |
| 3. Yes, and don't think BART was involved | 854 | ( 34) |
| 4. Yes, and don't know if BART was involved | 96 | ( 4) |
| 5. No answer | 4 | - |
| | 2,541 | (100) |

50b. "Do you know anyone who moved out recently or is planning to?"

| | n | % |
|---|---|---|
| 1. No | 1,574 | ( 62) |
| 2. Yes, and think BART was involved | 98 | ( 4) |
| 3. Yes, and don't think BART was involved | 793 | ( 31) |
| 4. Yes, and don't know if BART was involved | 70 | ( 3) |
| 5. No answer | 6 | - |
| | 2,541 | (100) |

51. "Did (respondent's) move have anything to do with BART?"

| | n | % |
|---|---|---|
| 1. Had nothing to do with BART | 2,480 | ( 98) |
| 2. To get closer to BART | 36 | ( 1) |
| 3. To get farther away from BART | 13 | ( 1) |
| 4. No answer | 12 | - |
| | 2,541 | (100) |

TABLE 2.5
ACTIONS TAKEN TO SUPPORT OR PREVENT BART

46. "Have you ever done any of these things in either trying to get BART into your neighborhood or to keep it out?"

| | In | | Out | |
|---|---|---|---|---|
| | n | % | n | % |
| Talked to neighbors | 118 | (4.6) | 64 | (2.5) |
| Attended a meeting | 38 | (1.5) | 27 | (1.1) |
| Signed a petition | 56 | (2.2) | 33 | (1.3) |
| Letter to public figure | 15 | ( .6) | 11 | ( .4) |
| Letter to newspaper | 9 | ( .4) | 6 | ( .2) |
| Drew up petition | 10 | ( .4) | 9 | ( .4) |
| Voted for a candidate | 107 | (4.2) | 38 | (1.5) |
| Organized an action group | 11 | ( .4) | 9 | ( .4) |
| Filed suit | 3 | ( .1) | 5 | ( .2) |
| Something else | - | - | - | - |

## Further Analysis on Q 40a, 43 and 49

Some additional analyses were performed with these general attitude variables in connection with their role as indicators of anticipated impact. These are presented with the analysis of anticipations of specific impacts in the later chapter on that topic (pp. 23).

## MOVING BEHAVIOR AND OTHER BEHAVIORAL INDICATORS

Tables 2.4 and 2.5 present the response distributions of the interview items which may be useful as early indicators of active behavioral responses to BART as a source of environmental impact. In general, BART's influence on moving behavior was apparently quite small up to the time of the survey. In addition, very few respondents indicated that they had taken any overt action either for or against BART.

### Moving Behavior (Q 50a, 50b and 51)

#### Effect of Distance and Configuration on Moving Behavior

An appropriate initial hypothesis here is that the rate of moving would be higher in areas of greater potential environmental impact such as those nearer BART in general and in areas of aerial configuration. However, distance to either BART stations or tracks proved insignificant statistically (chi-square). In addition, the combined effect of distance and configuration was neither consistent nor significant.

#### Moving Behavior in the Special Sites

The "special sites" data set was also inspected for indications of major variations in moving behavior for the different sites. Interpretation of these data must be cautious, in view of the non-randomness of the samples and the small sample sizes ($n \simeq 20$). Only in the Union City site did as many as five respondents say that their move there was due to BART. In all but two other sites this was no more than one respondent. Sites in which more than five respondents felt that others had moved either in or out due to BART were as follows:

| Move In | Move Out |
|---|---|
| North Berkeley Station (7 responses) | Bay Fair Station (6) |
| Hearst Avenue Channel (6) | Concord Station (8) |
| Albany Linear Park (8) | Daly City Station (7) |
| | Carlson Channel (6) |

All three "in-mover" sites are near one another in the Berkeley area, which is historically subject to high moving rates. There is no apparent BART-related factor further encouraging in-movement. The "in-mover" sites are mainly station areas in which substantial residential land was taken for parking lot construction similar to many other sites. All in all, these special sites data do not appear to provide useful additional insights into BART's effects on moving behavior.

## Actions Taken For or Against BART

### Effects of Distance and Configuration

Due to the small number of respondents who reported that they had taken any actions at all, analysis was necessarily limited. The responses to individual items were combined into an index of the number of different actions taken, as a crude indicator of the degree of commitment. This revealed that while 8.7 percent of all respondents did at least one thing to get BART into their neighborhood (usually talking to neighbors or voting), only 1.2 percent -- or 30 people out of 2,541 -- did more than two things. Similarly, only 4.3 percent did anything to keep BART out of their neighborhood, with one percent (20 people) doing more than two of the things listed.

The effect of distance from BART lines or stations on response was not significant. Combined effects of distance and configuration were likewise negligible and unreliable due to the small cell sizes involved.

### Actions Taken in the Special Sites

A review of the special sites responses indicated that substantial proportions of the respondents in a number of sites took at least one action. In contrast to the systemwide rate of five to eight percent, over five (about 25 percent) of the respondents in five of the 28 sites took action in favor of BART, while this level of involvement in keeping BART out was reached in eight sites. These sites were as follows:

| Actions for BART | Against BART |
|---|---|
| Bay Fair (12 actions) | Concord (16) |
| Concord (11) | Rockridge (13) |
| Lake Merritt (8) | Pleasant Hill (9) |
| El Cerrito del Norte (7) | Ashby (9) |
| Albany Linear Park (6) | Daly City (9) |
| | North Berkeley (8) |
| | El Cerrito del Norte (8) |
| | Albany Linear Park (7) |

This suggests that a relatively high level of action, particularly against BART, may have existed in a number of areas very close to BART. Despite the inability of the systemwide sample data to display the relationship, residents in at least some and possibly many areas very close to the BART line may continue to have a high level of active response to BART.

# ANTICIPATED IMPACTS OF BART IN OPERATION

## CASE SELECTION

As in the study of construction impacts, respondents living in the downtown area of San Francisco were excluded from this analysis. These amounted to 172 cases out of a total of 2,541. Further explanation of this refinement is found on page 39.

## SURVEY RESPONSES

Items relevant to this investigation included a set of 30 statements, each addressing a specific possible impact on the area, with which the respondent registered his agreement or disagreement on a five point rating scale. In addition, six more items focused on the respondent's expectations of being bothered personally by BART characteristics such as noise, vibration and light. These items formed the set of "dependent variables" to be studied.

Although it is impractical to present response distributions here for each of the many items on anticipated impacts, inspection of the items rank ordered by level of agreement by respondents is a useful means of introduction to the data. Table 3.1 presents the items in this manner, using a combination of the responses "agree strongly" and "agree somewhat." As a basis for comparison, the corresponding level of disagreement is also shown for each item.

Table 3.2 completes the presentation of the basic data items and their overall responses.

## REDUCTION OF DEPENDENT VARIABLE SET

In view of the large number of dependent variables (36) and the objective of assessing the significance of various potential predictors of the responses to these variables, the need for reduction of the data set becomes obvious. A factor analysis of the 30-item pool of anticipations of impact -- most of the dependent variables -- was used for this purpose. The loadings of the 30 variables on the resultant six factors are displayed in Table A of the Appendix.*

---

*This analysis was conducted prior to this study by Dr. Frances Carp and R. T. Zawadski, but has not been documented elsewhere.

TABLE 3.1
ANTICIPATED BART IMPACTS RANK ORDERED BY RESPONDENT AGREEMENT

| | | % Agree | % Disagree |
|---|---|---|---|
| v. | Taxes will go up | 68 | 11 |
| p. | Traffic on nearby freeways reduced | 66 | 20 |
| o. | Less air pollution (less driving) | 62 | 22 |
| e. | More apartment buildings | 55 | 24 |
| u. | People will have pride in modern city | 49 | 20 |
| i. | More parking lots and garages | 47 | 33 |
| h. | Less open space in this area | 45 | 32 |
| f. | More stores will come to this area | 44 | 31 |
| b. | More high-rise buildings | 42 | 30 |
| d. | Property bought up by rich | 41 | 29 |
| g. | More offices and industry in this area | 38 | 36 |
| k. | BART facilities will hide shady characters | 35 | 37 |
| 3. | Area will be better looking | 34 | 31 |
| y. | Stores will suffer; shoppers go elsewhere | 34 | 35 |
| n. | Increased parking problems for residents | 34 | 48 |
| 1. | More salesmen in the area | 30 | 34 |
| w. | Danger from people straying onto tracks | 29 | 48 |
| 4. | Area will be quieter | 28 | 39 |
| c. | More residential development, subdivisions here | 26 | 37 |
| m. | Traffic on streets near me will increase | 25 | 56 |
| t. | In general, area will be much safer | 24 | 33 |
| l. | Area will be better for walking, exercise, etc. | 24 | 33 |
| x. | Danger from BART train derailing | 24 | 47 |
| a. | Lot of homes will go up for sale | 22 | 49 |
| z. | Area will be better for children playing | 20 | 36 |
| j. | Undesirables will move in | 20 | 50 |
| 2. | Area better for neighbors to get together | 18 | 34 |
| r. | More trash, litter in streets | 18 | 58 |
| s. | More dirt, dust in the air | 13 | 64 |
| 9. | Area will generally go downhill | 8 | 68 |

TABLE 3.2
EXPECTATIONS OF ANNOYANCE FROM BART IMPACTS (Q 47)

| | | Probably Will Bother | Probably Won't | Can't Say |
|---|---|---|---|---|
| a. | Noise of BART trains | 5.8% | 84.9% | 9.2% |
| b. | Noise of autos/people at station | 9.4 | 83.7 | 6.9 |
| c. | Vibrations of BART trains | 7.2 | 81.2 | 11.6 |
| d. | Lights from BART trains at night | 3.7 | 89.3 | 7.0 |
| e. | Fumes from BART trains | 5.4 | 84.4 | 10.1 |
| f. | BART passengers looking in my windows | 3.3 | 91.8 | 4.9 |

Of these six "dimensions of BART's anticipated impact" (labeled as "DBIs" in the pre-BART master data file), four were chosen for use in the present analysis. These were as follows:

Factor 1: Urban Development
2: Neighborhood Improvement
3: Neighborhood Deterioration
5: Traffic/Pollution

Table A in the Appendix indicates the variables which constitute the core of each of these factors. This allows the reader to verify their "meanings" independently.

Of the original 30 variables in this set, 26 are correlated above .35 with one of the factors. Only one of these is correlated this highly with more than one factor, and most other variables' loadings on any given factor are negligible. The factors therefore appear to be quite distinct and unambiguous in interpretation. Accordingly, the four factors (DBIs) were used for the remaining analyses in lieu of the 26 original variables.

The remaining four variables (those not correlated at least .35 with a factor) were as follows:

v. Taxes will go up.

w. There will be danger from children or adults straying onto the BART tracks.

x. There will be danger from a BART train going off the track.

y. Some stores in the area will suffer since people will shop elsewhere.

These variables were omitted from further study. The first and last do not appear to be of major relevance in the Environment Project. The remaining two were not among the major concerns of respondents, and subsequent experience indicates that they are not likely to be of practical significance.

Six dependent variables remained -- the anticipations of annoyance with specific BART characteristics, which because of their yes/no response format were not appropriate for inclusion in the factor analysis. Of these, items on lights from BART trains at night, fumes from BART trains, and BART passengers looking in the respondents' windows were dropped from further study both because of their doubtful substantive value and the very low incidence (three to five percent) of concern registered by respondents. The remaining three,

dealing with vibration and noise from trains and station traffic, were retained. The final set of seven dependent variables thus included four factors and three additional variables, without significant loss of information.

## SELECTION OF POTENTIAL RESPONSE DETERMINANTS

To select potential determinants of anticipated impacts, ideas were drawn from a variety of sources including the early URES hypotheses, analyses of the URES data prior to the Environment Project, a variety of research reports and theories from sources outside the BART Impact Program, and the ENV study team. Using these (many) predictor variables and a number of the original dependent variables, simple correlations and cross tabulations were run to eliminate the predictors not significantly related to the dependent variables.

In addition to the remaining predictors, the analysis described in this study's second chapter (General Indicators of Impact) provided some suggestions, particularly in favor of the variable "expected use of BART." Finally, some intuitively attractive candidates not in the original set were added. From all these sources a set of approximately 20 predictors was selected. These are listed in Table 3.3.

## ANALYSIS

### Effect of Distance and Configuration

As a further reduction of the data, it was determined that of the seven dependent variables some would be assumed relevant only with respect to stations and others to the BART line. This division was as follows:

| Station | Line |
|---|---|
| Urban Development (Factor 1) | BART train noise |
| Neighborhood Improvement (Factor 2) | BART train vibration |
| Neighborhood Deterioration (Factor 3) | |
| Traffic/Pollution (Factor 5) | |
| Auto Noise at Stations | |

Significance of the effects of distance and configuration of lines or stations, as appropriate for each dependent variable, was determined through chi-square tests. In addition, a full set of one-way analyses of variance was generated with respect to the BART configuration effect, controlled for distance in 1/4-mile increments. This provided an alternative method

TABLE 3.3
VARIABLES SELECTED AS PREDICTORS OF IMPACT EXPECTATIONS

| | |
|---|---|
| BART Attributes | Location (distance to BART line)<br>Location (distance to BART station)<br>Track configuration |
| Environmental Characteristics | Distance to freeway<br>Distance to railroad<br>Interviewer noticed noise<br>Can see BART from home |
| Social-Situational Variables (census block data) | Percent over 1 person per room<br>Percent owner occupied |
| Family/Personal Characteristics | Presence of children under 12<br>Home owner/renter<br>Driver/non-driver<br>Expected use of BART<br>Evaluation of own power in society<br>Noise sensitivity<br>Age<br>Sex<br>Income<br>Education |

for these tests and also yielded estimates of the proportion of response variance accounted for by configuration.

Results of these many tests are summarized in Table 3.4. The estimated proportion of variance accounted for by distance to BART, where its effect was significant, ranged from 0.4 percent to a high of only four percent and is not tabulated here.

Subsequent Controls for Distance and Configuration

The frequent evidence of a marked decrease in anticipations of impact beyond about 1/4 mile from BART, as shown in Table 3.3, suggests that the post-BART survey data collection may not need to be extended as far as a mile from BART, as was done in the URES study. A distance of 1/4- to 1/2-mile may be adequate, provided that the project's physical impact studies do not indicate a broader dispersion of actual impact. This possibility was incorporated into the study's remaining tests by dividing the systemwide sample at 1/4-mile from the line and excluding subway sections for comparisons of response within and between the two distance groupings. At the same time, since most impacts in subway areas seem related to the station rather than the line, a similar two-sample set was constructed between respondents living within 1/2-mile of (a) subway and (b) above-ground (aerial) stations. These four groups formed the basis for the study of the effects of other response determinants.

Effects of Other Determinants

As a first step in assessing the relevance of the remaining hypothesized determinants of response, correlation matrices were generated for each of the four controlled subsamples just described (within 1/2-mile of subway versus aerial stations; within and beyond 1/4-mile of aerial lines). These correlation matrices included both the relevant dependent variables (or factors) and their hypothesized determinants.

A criterion of "r less than 0.10" was used as an indicator of lack of significant relationship with the (controlled) response variable. The results of this test are presented in Tables 3.5 and 3.6, and indicate that most of the hypothesized relationships were quite weak.* In addition to the

*A few of the variables under study had neither an interval nor even a clearly ordinal scale of measurement. In such cases the use of the correlation coefficient may be misleading. For tests of association involving these items, other techniques such as the analysis of variance or the chi-square contingency measure could be used as a check on the findings reported here. Such checks, however, were not made in this analysis.

TABLE 3.4
SUMMARY OF DISTANCE/CONFIGURATION EFFECTS ON ANTICIPATIONS OF IMPACT

| Dependent Variable or Factor (DBI) | Effects of Station Configuration | Effects of Distance from Station |
|---|---|---|
| DBI #1: Urban Development | Significant at all distances; those near aerial stations tend to agree more with the factor's items. | Significant for aerial and nearly so for subway; pronounced drop in agreement after 1/4-mile. |
| DBI #2: Neighborhood Improvement | Generally not significant | Not significant |
| DBI #3: Neighborhood Deterioration | Significant at some distances, incl. 1/4 mile, but not consistently. In first 1/4 mile agreement with factor items is higher in subway areas. | Significant; first 1/4-mile has higher agreement with factor items under both subway and aerial configurations. |
| DBI #5: Traffic/ Pollution Reduction | Not significant. | Not significant. |
| Auto Noise at BART Stations | Not significant. | Significant, with first 1/4 mile (in all configurations) indicating greater concern than all others. |
| | Effects of Line Configuration | Effects of Distance from Line |
| BART Train Noise | Significant at 1/4 mile and total; greatest concern near aerial lines. | Significant for all configurations, with greatest concern within 1/4-mile. |
| BART Vibration | Not significant. | Significant (for all configurations), with greatest concern within 1/4-mile (1/2-mile for aerial). |

TABLE 3.5
PREDICTORS SIGNIFICANTLY RELATED TO STATION - RELEVANT DEPENDENT VARIABLES*

| Predictor | Dependent Variables: Urban Develop. Sub. | Urban Develop. Aer. | Nbhd. Improve. Sub. | Nbhd. Improve. Aer. | Nbhd. Deter'n Sub. | Nbhd. Deter'n Aer. | Pollution Reduc. Sub. | Pollution Reduc. Aer. | Noise at Stations Sub. | Noise at Stations Aer. |
|---|---|---|---|---|---|---|---|---|---|---|
| **Personal Characteristics** | | | | | | | | | | |
| Age | -x | -x | x | x | -x | -x | | | -x | -X |
| Sex (0=M, 1=F) | | | | | | | | | | |
| Income | | | | | | -x | | | | |
| Education | | | | | | -x | | | | |
| Noise Sensitivity | | -x | x | | | -x | | | -x | |
| Children Under 12 | | x | | | | | | | | |
| Expected Use of BART | | | -X | -X | x | x | -x | -X | | |
| Eval. of "power" | | | | | | x | -x | | | x |
| Driver/Non-Driver (0=drive) | | | | | | | | | | |
| Owns/Rents Home (0=own) | x | X | | | | | | | | |
| **Census Block Data** | | | | | | | | | | |
| % Over 1 Person/Room | | | | | | X | | | | x |
| % Owner Occupied | -X | -x | | | | -X | | | | |
| **Physical Environment** | | | | | | | | | | |
| Distance to Freeway | | | -x | | | -x | | | | |
| Distance to Railroad | -x | | | x | -x | -X | | | | -x |
| Interviewer Noticed Noise | | | | | | x | | | | |
| Can See BART from Home | | | | | | -x | | | | -X |
| Distance to Station | -x | -X | | | | -X | | | | -X |

*X = r ≥ .20
x = 0.10 ≤ r < 0.20
- = inverse relationship

TABLE 3.6
PREDICTORS SIGNIFICANTLY RELATED TO LINE - RELEVANT DEPENDENT VARIABLES*

| | Dependent Variables | | | |
|---|---|---|---|---|
| | BART Train Noise Perceived | | BART Vibration Perceived | |
| Predictor | 0-¼ mi. | ¼-1 mi. | 0-¼ mi. | ¼-1 mi. |
| Personal Characteristics | | | | |
| Age | | | | |
| Sex (0=M, 1=F) | | x | | x |
| Income | | -x | | -x |
| Education | x | | | |
| Noise Sensitivity | | | | |
| Children Under 12 | | | | |
| Expected Use of BART | | | | |
| Eval. of "power" | | | | |
| Driver/Non-Driver (0=drive) | | x | | x |
| Owns/Rents Home (0=own) | | | | |
| Census Block Data | | | | |
| % Over 1 Person/Room | | | | |
| % Owner Occupied | | | -x | |
| Physical Environment | | | | |
| Distance to Freeway | | | | -x |
| Distance to Railroad | | | | |
| Interviewer Noticed Noise | | | | |
| Can See BART (0=no,1=yes) | -x | | | |
| Distance to BART Line | -X | | -X | -x |

*X = $r \geq 0.20$
x = $0.10 \leq r < 0.20$
- = inverse relationship

relatively specific dependent variables, two of the more general indicators of respondents' feelings about having BART in their area were also subjected to this analysis of correlations with the predictor set. Significant relationships between predictors and these two attitudinal variables are presented in Table 3.7.

## CONCLUSIONS

### General Relationships

Of the variables hypothesized as determinants (predictors) of anticipations of impact, the strongest appeared to be the respondent's expected use of BART. This was especially true as a correlate of the respondent's general feelings about BART's being near his/her home. This one determinant accounted for from five to as much as 20 percent of the total variation in these general response items, depending on which of the four distance/configuration subsamples was involved.

Aside from the "expected use of BART" item, no single predictor accounted for as much as ten percent of the variation in any of the dependent variables. Most relationships provided independent "explanations" of only one to three percent of the variation. The many apparent interactions among predictors make it obvious that the variances attributed to each predictor are not additive. Much of the variation accounted for by each predictor is sure to vanish if all variables were to be combined into a single predictive structure. Since the number of predictors judged significant for each dependent variable was typically small, this indicates that the net amount of variation accounted for by all the predictors was quite low. Evidently, then, the phenomena under study are substantially more complex than can be described by the predictors chosen.

### Effect of the "Urban Development" Factor

This factor can be considered an indicator of the respondent's expectation of increased density of development and activity, with corresponding loss of open space. This might be termed a general land use impact measure. Comparison of the set of determinants judged to be significantly related to this concept between respondents living within 1/2-mile of subway and above-ground stations indicated that, all else equal, residents within 1/2-mile of a BART station expecting more of such impacts tend to be younger, renters rather than owners, and live relatively close to the BART station in contrast to

TABLE 3.7
PREDICTORS SIGNIFICANTLY RELATED TO GENERAL ATTITUDES CONCERNING BART'S EFFECTS*

| Predictor | Dependent Variables: Glad/Sorry BART Near — Aerial Line 0-¼ mi. | Glad/Sorry BART Near — Aerial Line ¼-1 mi. | Glad/Sorry BART Near — Nr. Stns. Sub. | Glad/Sorry BART Near — Nr. Stns. Aer. | BART Good/Bad Effect on Nbhd. — Aerial Line 0-¼ mi. | BART Good/Bad Effect on Nbhd. — Aerial Line ¼-1 mi. | BART Good/Bad Effect on Nbhd. — Nr. Stns. Sub. | BART Good/Bad Effect on Nbhd. — Nr. Stns. Aer. |
|---|---|---|---|---|---|---|---|---|
| **Personal Characteristics** | | | | | | | | |
| Age | | -x | | | | | x | |
| Sex (0=M, 1=F) | | | -x | | | | | |
| Income | | x | x | | | | | |
| Education | | x | x | | | | | |
| Noise Sensitivity | | | | | | | | |
| Children Under 12 | | | | | | | | |
| Expected Use of BART | -X | -X | -X | -X | -X | -X | -X | -X |
| Evaluation of "power" | -x | | | | -X | | | -x |
| Driver/Non-Driver | | | | | | | | |
| Owns/Rents Home | | | | | | | | |
| **Census Block Data** | | | | | | | | |
| % Over 1 Person/Room | | | | | | | | |
| % Owner Occupied | | | | x | | | | |
| **Physical Environment** | | | | | | | | |
| Distance to Freeway | | | | | | | | |
| Distance to Railroad | | | | x | | | | |
| Interviewer Noticed Noise | | | | | | | | |
| Can See BART from Home | | | | x | | | | |
| Distance to BART Line | x | | | | | | | |
| Distance to Station | | | | | | | | |

*X = $r \geq 0.20$
x = $0.1 \leq r < 0.20$
- = inverse relationship

those living in the same general proximity to a station but expressing a lesser expectation of land use impact. Near subway stations, those expecting such impacts also tended to live closer to railroad lines. Near aerial stations only, expectation of land use impact also tended to be higher among those with children and who did not rate themselves as more sensitive to noise than others.

Neighborhood Improvement Factor

Here the concept is an upbeat one, indicating expectations that BART will improve the area's quiet, appearance and suitability for children's play, enjoyment of the outdoors, getting together with neighbors, and the like. Residents within 1/2-mile of stations who expected such benefits tended to be older and planned to make more use of BART than others in the same areas. Near subway stations, this optimistic group tended to live closer to freeways and reported themselves to be more sensitive to noise than others. This suggests that a desire for alleviation of existing impacts may be involved in anticipation of BART's effects. Near aerial stations, optimism tended to be higher among those living farther from railroad lines, perhaps reflecting intercorrelations with other descriptors or persons living near rail lines in contrast with others.

Neighborhood Deterioration Factor

This factor indicates a generally pessimistic attitude toward the social impact on the area due to BART. Elements include "undesirable types of people moving in," "shady characters," more salesmen, more traffic near home, more dust and dirt, more litter, and the belief that "the area will generally go downhill." Near BART stations, persons who tended more toward such beliefs also tended to be younger, did not expect to use BART, and lived closer to a railroad than others in the same areas with less gloomy outlooks. Among residents near aerial stations specifically, this pessimism was held most often by poorer, less educated persons who felt less able to change conditions in their community. They also tended to rent and lived in more crowded dwellings nearer freeways, railroad tracks, and the BART station itself.

Traffic/Pollution Reduction Factor

This factor was basically an index of the expectation that BART would cause a reduction in freeway traffic and air pollution due to cars. The only significant correlate of this expectation found in the predictor set was expected use of BART, with those expecting to use BART tending more toward this belief. Among respondents near subway stations, only persons

who felt more able to change conditions in their communities also tended to believe more in BART's ability to reduce traffic and pollution. This result is difficult to interpret, and may be the result of other determinants acting through inter-correlation.

Noise (of Traffic and People at Stations)

Among those living within 1/2-mile of BART stations, persons expecting to be bothered by station noise tended to be younger than others in the area. No other generally significant correlates were identified. Near aerial stations specifically, however, those who expected to be bothered tended to feel less able to change community conditions and live in relatively crowded dwellings closer to a railroad and to the BART station. That is, concern appeared to be greatest among those most exposed to the impact and least able to influence it.

BART Train Noise and Vibration

The high correlation between those two dependent variables and the similarity of the predictor sets for both suggests that they are measuring a single concept. Within 1/4-mile of a BART above-ground line, the only consistent correlate of the expectation of being bothered by noise and vibration, however, was distance to the BART line. This indicates that there is a significant decline in concern with increasing distance, even within 1/4-mile of the line. For noise only, those within 1/4-mile expecting to be bothered tended to be more highly educated than others, while those expecting to be bothered specifically by vibration tended to live in areas of lower home ownership. Beyond 1/4-mile of an aerial line, those expecting to be bothered either by noise or vibration tended more to be female, poorer, and nondrivers.

General Attitude Concerning BART Being Nearby

For the two items indicating whether the respondent felt glad or sorry to have BART nearby and whether it would probably have a good or bad effect on the neighborhood, the major finding was that the respondent's plans to use BART far overshadowed all other potential determinants. This was true for both items among respondents both near and far from the line and around both subway and above-grade stations. From this finding it seems important to include questions on actual use of BART in any future survey of perceptions and evaluations of the system's environmental impacts.

## EARLY INDICATIONS OF BART FIXED-FACILITIES IMPACTS

A secondary objective of this study was to report on the URES data set's indications of BART's early impacts as a major new physical facility. Two indicators were available, dealing respectively with barrier effects and appearance. These are presented in Table 4.1 along with their overall distributions of response.

### EFFECTS OF DISTANCE AND CONFIGURATION ON INCIDENCE OF BARRIER COMPLAINTS

Cross tabulations of response versus a combination of distance and configuration were generated both with respect to BART stations and lines. A consistent relationship was found, as expected, with the incidence of complaints two to three times as high within 1/4-mile of BART above-ground stations (11 percent) and within 1/4-mile of at-grade lines (17.5 percent) as elsewhere. However, even this level of response is quite low.

#### Special Sites Data

A review of the responses to this question within the special sites sample revealed that approximately 13 percent of special site respondents felt that BART had "cut them off from what used to be part of their neighborhood." Interestingly, however, all four of the sites which had the highest incidence of reported barrier effects were at stations.

At all four stations (North Berkeley, El Cerrito del Norte, Rockridge and Concord), the line itself forms no physical barrier, but multi-block residential areas had been demolished to provide space for BART commuter parking. This finding suggests that this item may have been interpreted to refer to demolition effects as well as barriers as generally defined.

### APPEARANCE

The item available, which gives information only on the proportion of respondents able to actually see BART from their homes, was included here for its limited value as an early indicator of the extent of potential appearance impacts. As shown in Table 4.1, only about 15 percent of the systemwide sample could see any BART facilities. Later analysis of this item in connection with post-BART evaluations of appearance

(quality, contrast, scale, etc.) may prove useful, but at this stage no further study was felt to be warranted.

TABLE 4.1
INDICATORS OF BART FACILITIES IMPACTS

48a. "Does BART in any way cut you off from what used to be part of your neighborhood?"

| | |
|---|---|
| Yes. . . . . | 3.4% |
| No . . . . . | 96.6 |
| | 100.0% |

42e. "Can you see any of the BART trains, tracks, stations, or any part of the BART system from any place in either your house or yard?"

| | | |
|---|---|---|
| Cannot see any of BART. . . . . | | 85.1% |
| Can see . . . | trains. . . . . | 8.1 |
| | tracks. . . . . | 8.9 |
| | station . . . . . | 3.5 |
| | other . . . . . | 1.0 |

## CONSTRUCTION IMPACTS

This analysis dealt with the survey's battery of items dealing specifically with perceived effects of BART construction. Its purpose was to provide a general description of the extent and locations of different impacts as reported by those who experienced them. Since this subject is not specifically included in the Environment Project's principal concerns as defined by MTC, this information is provided primarily for use by others.

### CASE SELECTION

In order to reduce the potential for misleading data due to inclusion of responses from unqualified respondents, certain respondents were removed before consideration of BART's construction impacts. Three general groups were at issue. The first included those who had not lived in the area during the construction period; the second, those living in areas in which construction ended too long ago for memory to be reliable; and the third, persons living in the downtown area of San Francisco centered on Market Street, where BART's construction impacts were substantial but easily confused with the impacts of the many other construction projects and similar disruptions constantly occurring in such an area.

The latter two groups were excluded without difficulty. However, the form of the data as coded allowed only an approximation of the desired sample refinement, particularly in eliminating those not living at the interview address during the construction. The final exclusions were as follows:

1. Downtown San Francisco: All respondents for whom the Civic Center, Powell, Montgomery and Embarcadero stations were closest (maximum of 172 respondents).*

2. Construction period beyond reasonable memory: All respondents living in areas in which construction ended prior to 1969, i.e., at least 3-1/2 years before the interview (371 cases).

---

*These numbers of respondents are maximal, since cases meeting more than one of the exclusion criteria are counted under each.

3. Lack of exposure to construction: All respondents living at survey address less than one year (688 cases).

The resultant subsample included 1,444 cases, or 56.8 percent of the original total. It should be noted that for over a quarter of this group, the nearest BART construction did not end until 1973 -- six months after the pre-BART survey. Although it was not possible to identify the number of additional cases for whom construction ended in 1972 but after the survey, it can safely be concluded that construction was still in progress during the interview for at least a quarter and possibly a third of the refined "subjected to construction" subsample.*

Finally, with regard to the extent of construction impact, approximately 22 percent of the refined sample lived in areas in which the BART construction period was two years or less. Another 40 percent lived in areas with three or four years of construction, 26 percent had five or six years, and the remaining 12 percent lived in areas in which the construction period was seven or more years in length.

## SURVEY RESPONSES

The URES survey included a battery of items dealing with respondents' perceptions of BART construction impacts. Responses to these questions are presented in Tables 5.1 - 5.3, both for the respondents selected for further analysis and those omitted. These tables indicate that a substantial number of respondents felt adversely affected by BART construction. The reasons most often cited dealt primarily with travel impairment. Events most often attributed to the construction process were the removal of homes, closure of other facilities, and the creation of unattractive and dangerous areas. Between the two sample subgroups, as expected, there was a consistent tendency for the group selected for further study ("A") to indicate slightly higher incidence of impact. This is logically attributed to their generally greater exposure to the construction process.

### Effects of Distance and Configuration

Cross tabulations of response versus a combination of distance and configuration were generated for all questions for which at least four percent of the respondents indicated concern. For the two general questions, the effect of configuration

---

*The nature of construction then in progress, and therefore the severity of impact at the time of the survey, is not included in the data.

TABLE 5.1
RESPONSES TO GENERAL QUESTIONS ON CONSTRUCTION IMPACTS

Q44b. "Has the BART construction affected you or your family in any way?"

| | | Subsamples* A | Subsamples* B |
|---|---|---|---|
| 1. | Yes, it has affected me or family | 29.5% | 26.4% |
| 2. | No, has not | 70.5 | 73.6 |
| | | 100.0% | 100.0% |

Q44e. "In general, would you say the BART construction period for you has been ..."

| | | A | B |
|---|---|---|---|
| 1. | Very unpleasant | 6.6% | 6.5% |
| 2. | Somewhat unpleasant | 33.6 | 28.5 |
| 3. | Not at all unpleasant | 59.8 | 65.0 |
| | | 100.0% | 100.0% |

* Subsample A: Those selected for further analysis

B: Those omitted from further analysis on the basis of location, length of residence, or elapsed time since end of nearby BART construction

TABLE 5.2
NEGATIVE EFFECTS OF BART CONSTRUCTION ON RESPONDENT OR FAMILY, RANKED BY FREQUENCY OF MENTION

44c. "Has BART construction made any of the situations listed on this card any worse for you or your family?"

| | | Subsample A (Selected) | Subsample B (Omitted) |
|---|---|---|---|
| q. | None of these | 53.2% | 51.5% |
| d. | Getting to stores, schools | 16.1 | 10.2 |
| c. | Getting to and from work | 13.0 | 11.2 |
| e. | Going places on foot | 10.9 | 6.3 |
| a. | Traffic on your street | 8.1 | 5.4 |
| m. | Appearance of neighborhood | 6.0 | 5.8 |
| n. | How you use the street | 6.0 | 4.5 |
| h. | Noise at home | 5.0 | 4.1 |
| b. | Parking on your street | 4.4 | 3.1 |
| k. | Litter, trash in neighborhood | 2.5 | 2.7 |
| i. | Fumes, odor at home | 1.5 | 2.1 |
| g. | Crimes in your area | 1.0 | 1.2 |
| f. | Contact among your neighbors | 1.0% | 1.0% |
| l. | Privacy at home | | |
| o. | How you use your front/back yard | | |

TABLE 5.3
EVENTS ATTRIBUTED TO BART CONSTRUCTION BY RESPONDENTS, RANKED BY FREQUENCY OF MENTION

44d. "As a result of BART's right-of-way and the construction of BART did you notice any of these things happening here in this area where you live?"

| | | Subsample A (Selected) | Subsample B (Omitted) |
|---|---|---|---|
| l. | None of these | 56.1% | 57.1% |
| a. | Neighbors had houses torn down | 15.1 | 10.0 |
| c. | Community facilities (stores, theaters, etc.) closed | 11.6 | 6.9 |
| f. | Unattractive areas sprang up | 10.5 | 8.4 |
| g. | Dangerous areas sprang up | 10.1 | 8.3 |
| e. | Theaters or restaurants closed | 6.7 | 3.7 |
| b. | Neighbors decided to move away | 6.2 | 5.2 |
| j. | Places where neighbors took walks, exercised, walked dogs, enjoyed the outdoors, were lost | 4.7 | 3.3 |
| h. | Places where children played were spoiled, lost | 3.3 | 3.8 |
| i. | Places where neighbors used to get together were lost | 2.4 | 1.3 |
| d. | Schools closed | 1.0% | 1.0 |
| k. | The use of any part of your house or yard lost | | |

(controlled for distance) was generally consistent and significant. This held both for BART line and station areas (Tables 5.4 and 5.5). In both cases respondents near a subway configuration reported adverse impacts much more frequently than did those near above-ground (at-grade and aerial) sections. As the tables show, in many instances subway-area respondents living near a BART subway rather than aerial or at-grade facilities were as much as twice as likely to report construction impact.

The tables also show that the effect of distance controlled for configurations was inconsistent. This indicates interaction between these variables or a more complex set of causal factors. The analysis therefore moved to the specific items on different kinds of impact in order to separate some of these complicating influences.

Review of tabulations of response versus distance/configuration for each of the "situations made worse for you or your family" and "noticed these things happening as a result of BART construction" yielded somewhat more meaningful results. Interpretation of these tables was based on logic and consistency of relationships for each main effect and their simple interactions. Statistical tests of significance were impractical due to the number of tables required, and were not used. However, the criteria of logic and consistency are of greater relevance here in any case. Any further study of these construction impacts should include efforts at reduction of this item pool. This could be done effectively through factor analysis.

Results of this interpretation are summarized in Tables 5.6 and 5.7. These results display a pattern in which BART configuration (generally both line and station) is meaningfully related to the incidence of reported impact. For most items, as shown by the valences attached to each item in Tables 5.6 and 5.7, perception of impact is greatest in subway areas. Although not shown in these tables, the perception of impact was most often lowest in aerial-configuration areas, with responses in at-grade sections tending to move between these two extremes.

Exceptions to this pattern were found for residential demolition and moving, as would be expected since land clearance was much more extensive in above-ground configuration areas.

The effect of distance was found to be substantial as well. Virtually all impacts tended to decrease in frequency of mention as distance from BART lines or stations increased. The only exceptions noted here were travel-related impacts, which generally displayed no consistent relationship with

TABLE 5.4
EFFECTS OF DISTANCE AND CONFIGURATION ON RESPONSE TO QUESTION 44b

44b. "Has the BART construction affected you or your family in any way?" (Percentage of "yes" responses shown)

1. With respect to nearest BART line segment:

| Distance to Line | Configuration | | |
|---|---|---|---|
| | Subway | At-Grade | Aerial |
| 0 - 1/4 mi. | 40.2% | 30.4% | 20.2% |
| 1/4 - 1/2 mi. | 37.3 | 17.2 | 15.3 |
| 1/2 - 3/4 mi. | 37.6 | 13.2 | 23.1 |
| 3/4 - 1 mi. | 36.9 | 28.2 | 19.2 |

2. With respect to nearest BART station:

| Distance to Station | Configuration | |
|---|---|---|
| | Subway | Aerial |
| 0 - 1.4 mi. | 35.0% | 27.4% |
| 1/4 - 1/2 mi. | 40.9 | 21.1 |
| 1/2 - 3/4 mi. | 34.4 | 20.0 |
| 3/4 - 1 mi. | 31.2 | 16.7 |

TABLE 5.5
EFFECTS OF DISTANCE AND CONFIGURATION ON RESPONSE TO QUESTION 44e

44e. "In general, would you say the BART construction period for you has been very unpleasant/somewhat unpleasant/ not at all unpleasant?" (Percentages of "very"/"somewhat unpleasant" responses tabulated)

1. With respect to nearest BART line segment:

| Distance to Line | Configuration | | |
|---|---|---|---|
| | Subway | At-Grade | Aerial |
| 0 - 1/4 mi | 57.2% | 35.9% | 25.0% |
| 1/4 - 1/2 mi. | 53.3 | 21.8 | 25.9 |
| 1/2 - 3/4 mi. | 50.2 | 24.2 | 24.7 |
| 3/4 - 1 mi. | 59.5 | 35.9 | 15.4 |

2. With respect to nearest BART station:

| Distance to Station | Configuration | |
|---|---|---|
| | Subway | At-Grade |
| 0 - 1/4 mi. | 52.0% | 35.7% |
| 1/4 - 1/2 mi. | 54.9 | 25.4 |
| 1/2 - 3/4 mi. | 50.9 | 23.9 |
| 3/4 - 1 mi. | 51.6 | 16.6 |

TABLE 5.6
EFFECTS OF BART CONFIGURATION AND DISTANCE ON INCIDENCE OF REPORTED NEGATIVE CONSTRUCTION IMPACTS (Q 44c)

| Response Item | Effects of Line/Station Configuration* | Distance to Line/Station** |
|---|---|---|
| b. Parking on street | x | x |
| m. Appearance of neighborhood | x | x |
| n. How you use the street | x | x |
| h. Noise at home | | x |
| a. Traffic near home | | x |
| c. Getting to and from work | x | |
| d. Getting to stores and schools | x | |
| e. Going places on foot | x | |
| (All others negligible or mixed effects) | | |

x=Consistent results at all levels of the controlled variable. Results for configuration show highest incidence of impact for aerial, lowest for subway; results for distance show highest incidence of impact for respondents closest to BART.

TABLE 5.7
EFFECTS OF BART CONFIGURATION AND DISTANCE ON INCIDENCE OF REPORTED EVENTS CAUSED BY BART CONSTRUCTION (Q 44d)

| Response Item | Effects of Line/Station Configuration* | Distance to Line/Station** |
|---|---|---|
| a. Neighbors had houses torn down | x | x |
| b. Neighbors decided to move away | x | x |
| c. Community facilities closed | x | x |
| e. Theaters or restaurants closed | x | x |
| f. Unattractive areas sprang up | x | x |
| g. Dangerous areas sprang up | x | x |
| (All others negligible or mixed effects) | | |

x=Consistent results at all levels of the controlled variable; same interpretation as in Table 3.6.

*Controlled, for distance
**Controlled, for configuration

distance. This suggests that BART construction was a substantial barrier to many of the local and regional auto trips originating in the entire study area and perhaps beyond, rather than affecting only those living very near it.

Construction Impacts in the Special Sites

When used cautiously and as a complement to the systemwide sample findings, the special sites data are potentially useful as a means of focusing on very specific situations along the BART line. To illustrate, Tables 5.8 and 5.9 compare the frequencies of reported impacts of the full systemwide and special sites data pools. This provides a test of the subjective evaluation of the effect of distance from BART, as presented in the preceding paragraphs. The results are consistent with those of Tables 5.6 and 5.7.

Further findings apparent in these tables are that the construction impacts most often cited by special sites respondents were dust and dirt, noise, neighborhood traffic, and appearance. These contrast sharply with the systemwide respondents' emphasis on travel-related impacts. However, even among special sites respondents, all of whom lived within approximately 1/8-mile of the line (i.e., two to three blocks), the overall level of reported construction impact was quite low. That is, although the effects of BART's construction were much more apparent in areas very near the tracks (special sites), these impacts still bothered relatively few people.

In Tables 5.10 and 5.11 are identified the special sites in which at least 25 percent of the respondents (five or more people) indicated specific construction impacts. The relative frequency of mentions indicates that the sites at BART stations, in contrast to channel sites, were the locations of greatest construction impact. With only one exception, these stations had parking lots. Although this could be due to biases in the interview items themselves, it provides an early indication that the aerial and subway stations with parking lots were the points of heaviest impact.

Finally, the tables indicate that construction impacts tended to be reported more frequently in suburban and higher-income areas than in disadvantaged or inner-city areas. This may reflect higher expectations or lesser tolerance by higher-income residents, but could as well be due to the fact that the higher impact sites (aerial stations) are more frequently found in higher-income or suburban locations.

TABLE 5.8
NEGATIVE EFFECTS OF BART CONSTRUCTION ON RESPONDENT OR FAMILY (Q 44c), RANKED FOR SPECIAL SITES SAMPLE AND COMPARED WITH SYSTEMWIDE SAMPLE RESPONSES

| | | Special Sites | Systemwide |
|---|---|---|---|
| 1. | None of these | 49% | 62% |
| 2. | Dust and dirt at home | 27 | 6 |
| 3. | Noise at home | 20 | 5 |
| 4. | Traffic on your street | 20 | 8 |
| 5. | Appearance of neighborhood | 18 | 7 |
| 6. | Going places on foot | 11 | 11 |
| 7. | Parking on your street | 10 | 5 |
| 8. | Getting to stores, schools | 9 | 16 |
| 9. | Getting to and from work | 9 | 14 |
| 10. | Litter and trash in neighborhood | 9 | 3 |
| 11. | How you use the street | 8 | 6 |
| 12. | Fumes, odors at home | 7 | 2 |
| 13. | Privacy at home | 5 | 1 |
| 14. | How use front/back yard | 4 | 1 |
| 15. | How you live in your house | 3 | 1 |
| 16. | Crimes in your area | 2 | 1 |
| 17. | Contact among your neighbors | 1 | 1 |
| 18. | Other | - | 1 |

TABLE 5.9
EVENTS ATTRIBUTED TO BART CONSTRUCTION BY RESPONDENTS (Q 44d), RANKED FOR SPECIAL SITES SAMPLE AND COMPARED WITH SYSTEMWIDE SAMPLE RESPONSES

| | | Special Sites | Systemwide |
|---|---|---|---|
| 1. | None of these | 47% | 62% |
| 2. | Neighbors' houses torn down | 41 | 15 |
| 3. | Neighbors moved away | 27 | 7 |
| 4. | Unattractive areas sprang up | 12 | 11 |
| 5. | Community facilities closed | 11 | 11 |
| 6. | Dangerous areas sprang up | 11 | 11 |
| 7. | Places where children played were spoiled, lost | 10 | 4 |
| 8. | Places where people took walks, etc., were lost | 9 | 5 |
| 9. | Theatres, restaurants closed | 5 | 6 |
| 10. | Places where neighbors used to get together were lost | 4 | 2 |
| 11. | Use of any part of house/ yard lost | 4 | 1 |
| 12. | Schools closed | 1 | 1 |

TABLE 5.10
NEGATIVE EFFECTS OF BART CONSTRUCTION CITED BY FIVE OR MORE RESPONDENTS IN DIFFERENT SPECIAL SITES

| Site | Impact Type: a. Traffic on your street | b. Parking on your street | c. Getting to/from work | d. Getting to stores, schools | e. Going places on foot | h. Noise at home | i. Fumes, odor at home | j. Dust, dirt at home | k. Litter, trash in neighborhood | m. Appearance of neighborhood | n. How you use the street |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stations: | | | | | | | | | | | |
| Rockridge | x | | | | x | x | | x | | | |
| Concord | x | | | | x | x | | x | | x | |
| Pleasant Hill | x | | | | | x | x | x | | x | |
| El Cerrito del N. | x | | | | | x | | x | | x | |
| North Berkeley | x | | | | | x | | x | | | x |
| Daly City | | | | | | x | | x | | x | |
| MacArthur | | | | | | | | x | | | |
| Ashby | x | | | | | | | x | | | |
| Mission/24th | x | x | x | x | x | | | | x | | |
| Lake Merritt | x | x | | | | | | | | | |
| West Oakland | x | | | | | | | | | | |
| Lines: | | | | | | | | | | | |
| Rockridge | x | | | | | x | | x | | x | |
| Mission/20th | | | x | | x | | | | x | | |
| Hearst | | | | | | | | x | | x | |
| Albany lin. pk. | | | | | | | | | | x | |
| Carlson | | | | | | x | | x | | | |
| Cayuga | | | | | | | | x | | | |

TABLE 5.11
EVENTS ATTRIBUTED TO BART CONSTRUCTION BY FIVE OR MORE RESPONDENTS IN DIFFERENT SPECIAL SITES

| Site | Impact Type: a. Neighbors had houses torn down | b. Neighbors decided to move | c. Community facilities closed | f. Unattractive areas sprang up | g. Dangerous areas sprang up | h. Places where children played spoiled or lost | j. Places where neighbors walked, exercised, walked dogs, enjoyed outdoors lost |
|---|---|---|---|---|---|---|---|
| Stations: | | | | | | | |
| Rockridge | x | | x | | | | x |
| Concord | x | x | | x | x | | x |
| Pleasant Hill | x | x | | | | x | x |
| El Cerrito del Norte | x | x | x | | | | |
| North Berkeley | x | x | | x | | | |
| Daly City | x | x | | x | x | | x |
| MacArthur | x | | | | | | |
| Ashby | x | x | | | | | |
| Mission/24th | | | x | | | | |
| Lake Merritt | x | | | | | | |
| West Oakland | x | x | x | | | | |
| Bay Fair | x | x | | | | | |
| Lines: | | | | | | | |
| Rockridge | x | x | | | | | |
| Hearst | x | | | x | | | |
| Merritt College | x | x | x | | | | |
| Albany lin. park | x | x | | | | | |
| Carlson | | x | | | | | |
| Cayuga | x | x | | | | | |

TABLE A
"DIMENSIONS OF ANTICIPATED BART IMPACT" FACTOR ANALYSIS

| Factors:* | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Name: | Urban Development | Neighborhood Improvement | Neighborhood Deterioration | Danger/Economic/Hardship | Traffic/ Pollution | New Residents |
| Variables | | | | | | |
| (Q.45)a. (120)** | .275 | -.084 | .384 | .282 | -.017 | .416 |
| b. (121) | .647 | -.014 | .164 | .031 | -.042 | .357 |
| c. (122) | .627 | .132 | .037 | .075 | .009 | .188 |
| d. (123) | .678 | -.003 | .135 | .110 | -.023 | .226 |
| e. (124) | .764 | .001 | .067 | -.011 | -.006 | .219 |
| f. (125) | .704 | .133 | .053 | -.016 | .036 | -.201 |
| g. (126) | .676 | .153 | .076 | .093 | .019 | -.236 |
| h. (127) | .669 | -.071 | .221 | .138 | -.001 | -.176 |
| i. (128) | .533 | -.027 | .297 | .020 | .110 | -.132 |
| j. (129 | .280 | -.059 | .525 | .324 | .007 | -.188 |
| k. (130) | .045 | -.111 | .386 | .448 | .033 | -.270 |
| l. (131) | .465 | .062 | .376 | .281 | -.005 | -.300 |
| m. (132) | .249 | -.110 | .659 | .042 | -.097 | -.141 |
| n. (133) | .225 | -.049 | .659 | .057 | -.076 | -.065 |
| o. (134) | .017 | .297 | -.154 | -.068 | .796 | .040 |
| p. (135) | .042 | .241 | -.112 | -.039 | .835 | -.032 |
| q. (136) | .039 | -.089 | .699 | .181 | -.048 | .174 |
| r. (137) | .101 | -.166 | .729 | .177 | -.044 | .128 |
| s. (138) | .086 | -.107 | .700 | .176 | -.156 | .179 |
| t. (139) | .101 | .608 | -.157 | -.052 | .169 | .069 |
| u. (140) | .052 | .525 | -.156 | .088 | .313 | -.034 |
| v. (141) | .198 | -.125 | .003 | .481 | -.106 | -.121 |
| w. (142) | .037 | -.055 | .208 | .746 | -.035 | .074 |
| x. (143) | .008 | -.057 | .138 | .773 | -.013 | .056 |
| y. (144) | .068 | .075 | .251 | .520 | .070 | .313 |
| z. (145) | -.010 | .772 | -.069 | -.061 | .050 | .060 |
| 1. (146) | .008 | .849 | -.042 | -.067 | .049 | .026 |
| 2. (147) | .041 | .828 | .006 | -.070 | .002 | .008 |
| 3. (148) | .095 | .755 | -.076 | -.026 | .057 | -.097 |
| 4. (149) | .001 | .734 | -.083 | -.070 | .150 | -.030 |

*Varimax rotation.
**Interview question no. first, then data set variable no. in parentheses.
Boxes identify variables which correlate > 0.35 with each factor.

## ENVIRONMENT PROJECT PHASE I DOCUMENTATION

- Interpretive Summary*
- Environmental Impacts of BART* Interim Service Findings (1976)
- Acoustic Impacts of BART* Interim Service Findings (1976)
- Impacts of BART on Air Quality* Interim Service Findings (1976)
- Impacts of BART on the Natural Environment* Interim Service Findings (1976)
- Impacts of BART on the Social Environment* Interim Service Findings (1976)
- Impacts of BART on Visual Quality* Interim Service Findings (1976)
- Theory Background for Study of BART's Impacts* (1976)
- Pre-BART Data Analysis* (1975)
- Community Monitoring* (1976)
- BART and Its Environment: Descriptive Data (1976)
- Research Plan* (1975)

## STUDY PARTICIPANTS

**Consultant Team**

Gruen Associates, Inc.
De Leuw, Cather & Company
Bolt Beranek & Newman, Inc.
TRW, Inc.
Curtis Associates
Dr. Frances M. Carp
Dr. Martin Wachs
Dr. Eugene Grigsby

**Performing Organization**

Metropolitan Transportation Commission

**Sponsoring Organization**

United States Department of Transportation
United States Department of Housing and Urban Development

*** Document is available to the public through the National Technical Information Service (NTIS), Springfield, Virginia 22151. Other documents are MTC internal working papers.**